

Technology Innovation Center

(An organisation's ability to learn Technology and translate that learning into action)

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Smart City Mission and **Digital India**, are two most ambitious programs, campaigned by the Government of India to ensure that eGov services are made available to citizens by making the country digitally empowered through technology interventions. While the **Smart Cities Mission** is an innovative drive for economic growth and improve the quality of life of people by enabling and harnessing technology as a means to create smart outcomes for citizens, and thus opportunities to improve lives, the **Digital India** program is drawn with a vision to transform India into a digitally empowered society and knowledge economy.

Smart World & Communication business vertical of Larsen & Toubro has been leading the market as MSI (Master Service Integration) in the areas of Smart City, City surveillance, ITMS (Intelligent traffic management systems), Smart Elements (Solid Waste Management, Smart Light, Smart Infra, Smart grid, Smart Parking, Environmental Sensor, and Command & Control Centre etc.), and Telecom infrastructure.

To sustain the technology leadership, we at Smart World & Communication, have fostered an innovative conceptual platform that serves the purpose of the business objectives with much impetus. The Center has been set up by L&T SWC is 'state-of-the-art' Innovation Center to upscale the Technological prowess of L&T SWC and align best possible solution exploiting the range of product & technologies, in a multi OEM environment.

"Technology Innovation Center (TIC) is an Innovation lab to upkeep a design thinking culture and unlock the potential of millennial technologies, making us stronger in the Digital World."

Our future growth relies on competitiveness and innovation, skills and productivity... and the only way you survive is you continuously transform into something else. It's this idea of continuous transformation that makes you an innovation company

Objective of TIC

- Technological Capability & Competency development through Innovation labs, Research, & training programs
- Design and Development of Smart City Technology Lab with all Solution Prototypes
- Collaboration with Institutions and Industries in India and abroad, to inculcate Design Thinking Culture

Technology Innovation Center accelerate opportunities, deepen relationships, and foster innovation.

- Showcase what is possible with digital transformation and IoT
- Build solutions with partners and start-ups, and engage in rapid prototyping
- Invest and partner with start-ups, accelerators, and universities



State of the art -Technology Innovation Center

The **Command and control center (CCC)** for the campus has been designed in an area of 5000 sq. ft, with replicating the scenario of smart city within 27 Acres, and as such major smart elements having been deployed and integrated with two CCC platforms.

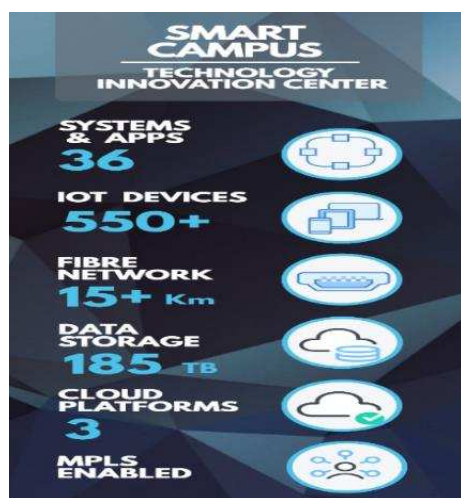
The interior and ambience have been carefully designed as per the occupational use and controlled lighting systems have also been in such a way to position the right ambience.

The entire space has been categorized into three zones, based on its usage:

- The **elevated floor** is for Technical/Operational use, comprising “Test Zone’ and ‘Command Centre’.
- The lowered floor is “Interactive zone’ used for interactions, discussions & presentations.
- The third zone is “Data center” located in the center as a central point of the design, and is positioning it as unique circular design.

The baffle ceiling denotes the data flow spreading from center to multiple directions in entire network. The baffle ceiling with undulation is for ‘acoustic’ to balance the echo.

The colors of **Technology Innovation Center** are picked rationally as Orange, blue and white respective to balance the vibrancy, tranquility and neutrality of the ambience.



Each wall being dedicated for different technology domains, the right and left wall for IOT, the wall at the entrance for robotics and the wall at the exit for ‘Artificial Intelligence’ strikes a futuristic look to the design. The glass partitions deliver a sophisticated look to the ambience. The lighting can be set to 16 million colors along with dim and brightness control capability. The colors of the lights can be changed by scanning any live movement or a taken picture as well. The lights can also synchronize with the sound decibel of the environment and flick accordingly.

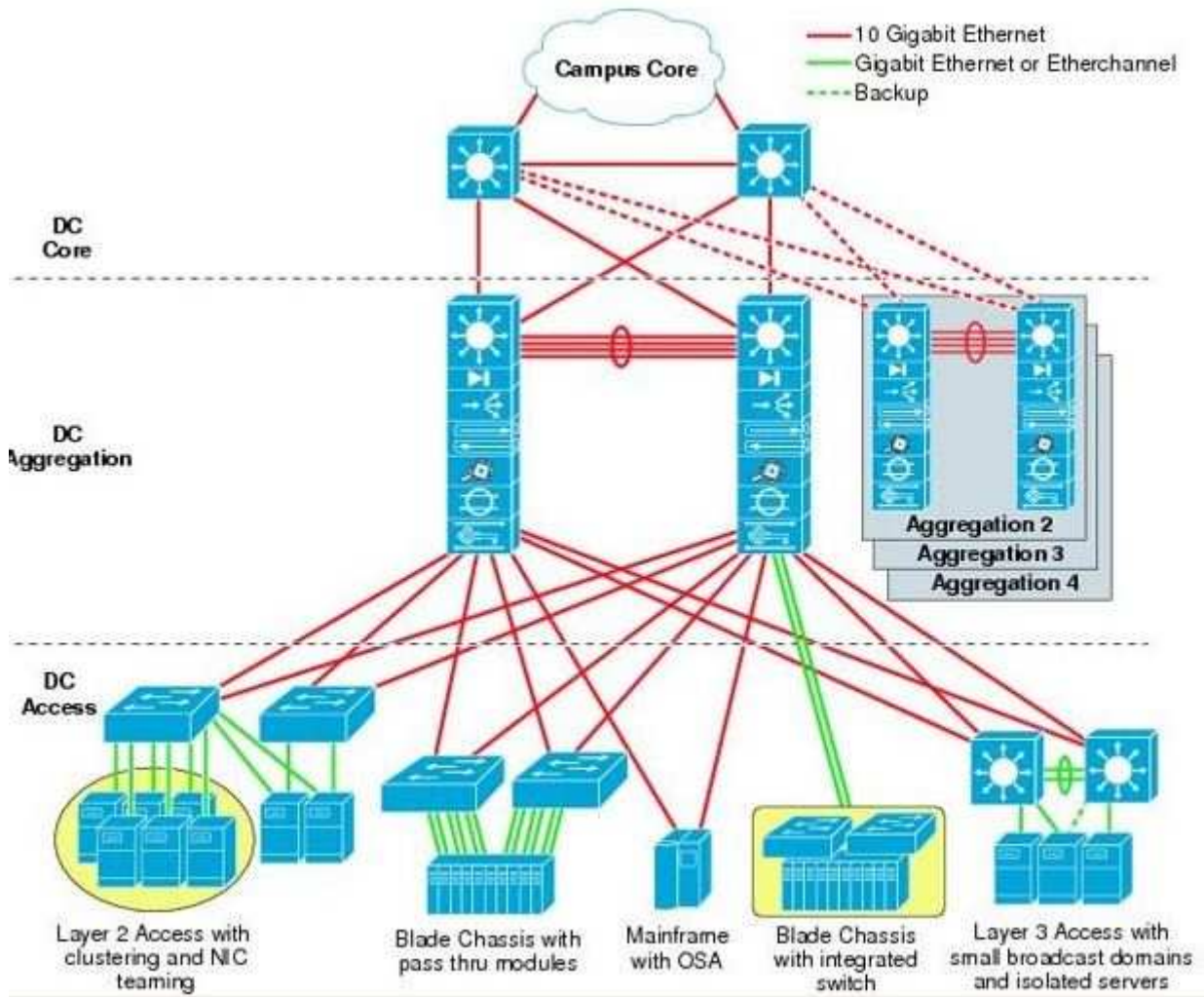
The **functional design** of Technology Innovation Center is conceptualized with the intention of creating the replica of the Smart City, Core Networks based on MPLS services with three Data Centers, transforming the entire campus as smart campus. High level description of the networks created is as per below:

- Deployment of 35+ systems, with 550+ IOT devices & smart elements
- Network created with almost 15+ Kms Optical fibre cable based network within L&T Chennai Campus
- Core network with MPLS services, connecting three 3 Nos. of Data Center and all POPs
- Three Nodal Data Centres (TEC DC, TCTC DC, CCTV DC)
- Cloud Solution (Amazon AWS, Microsoft Azure, CtrlS)
- Command and Control Centre

The Technology Innovation Center and Smart Campus has been developed with following technologies, architecture and provides services offering as per below:

Architecture using MPLS Network

- Two Cisco core routers (ASR 920 & ASR 903) are placed to which the core switch is connected.
- All the Core routers are configured on MPLS protocol. This forms the Core ring. OSPF protocol is enabled between the Aggregation switch to Core router.
- The Aggregation switches connected to the Cisco Core routers and have redundant links with each other, so that if one link fails or terminated
- The campus perimeter switches are divided into 3 access rings. Each access ring has a maximum of six switches. The two extreme perimeter switches in each ring, aggregates the traffic to the aggregate switch. Each switch in the core ring is enabled with the RSTP



TIC – High Level Network Architecture

Communication Technologies deployed

All kind of communication technology are implemented in the smart campus namely-

- **LoRa**
(Low Range digital wireless data communication technology)
- **ZigBee**
(ZigBee is an IEEE 802.15.4-based specification for low-cost, low-power wireless IoT networks and is used to create personal area networks with small, low-power digital radios)
- **Bluetooth**
(Bluetooth is a wireless technology standard for exchanging data between fixed and mobile devices over short distances using short-wavelength UHF radio waves) LAN
(A local-area network (LAN) is a computer network that spans a relatively small area)
- **GSM**
(GSM (Global System for Mobile communications) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks)
- **Li-Fi**
(Li-Fi is a wireless optical networking technology that uses light-emitting diodes (LEDs) for data transmission)



Communication Technologies at TIC

Command and Control Centre

The Integrated Command and Control Center (ICCC) acts as the “nerve center/ brain” for operations management, day-to-day exception handling and disaster management. It also provides insights by processing complex data sets at an aggregated level to derive intelligence for improved planning and policy making. The ICCC is envisaged to aggregate information across multiple applications and sensors deployed across the city, and then provide actionable information with appropriate visualization for decision makers

The ICCC @ TIC, has a holistic view of all the smart elements deployed in the campus, monitoring of the surveillance system and analytics with dashboard. Multiple Use Cases are defined for decision support engine for the campus for day to day management, thus transformed the campus as SMART.

At Technology Innovation Center (TIC), we have deployed ICCC from two major OEMs namely Trinity and Cisco.

- READY-TO-GO platform from Trinity, a home-grown Indian ICCC application for Smart Cities
- Agile & Scalable Command & Control Centre platform with capacity to integrate +50 IoT systems
- Cisco Kinetics for Cities (CKC) is a Global ICCC platform for Smart Cities
- Native & Open IoT layer for Direct device integrations
- Integrated Collaboration Solution for seamless communication with various technologies, instantly



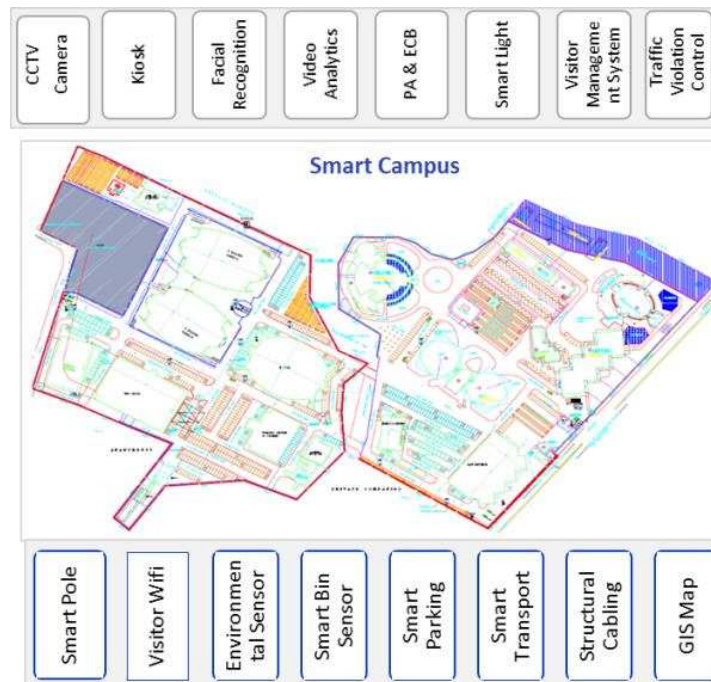
Integrated Command and Control center Platform - Trinity



Cisco Kinetics for Cities – ICCC Dashboard

Smart Elements deployment within L&T Campus

We have deployed most of the Smart Elements within campus, and integrated with Command & Control Center for making 27 acres of Green campus as “**Smart & Intelligent campus**”, by having analytics, API based Application integration for dashboard SOP & Use-cases. Some of the system use-cases are discussed below which are implemented at L&T’s Smart Campus.



The L&T Campus - a 'Smart City's Living Prototype'

Data Centers and Cloud– Accelerating a digital future

The Data Centers are positioned with hybrid solution of 'on premise' and Cloud. We have positioned three physical Data Centers in two diversified locations/buildings and one in TIC site. Three cloud service providers have been integrated to have complete diversity and redundancies, to enable us to have POC (Proof of concept) testing in all possible scenarios.

The **Technology Innovation Center** has positioned a high impact platform, cutting across stakeholders in all the three dimensions viz. Our Customers, OEM Partners, and Employees, thereby intent is to exploit cutting-edge technologies for positioning new innovative solutions. The Technology Innovation Center will also enable us in driving our vision with following Value Drivers

Technology & Innovation

- Lead Adopter of New Technologies
- Technologies for all Biz. Verticals
- Product/Technology Benchmarking Business Support
- Niche Knowledge Transfer Platform
- PoC Lab and Live Simulators
- Product Validation

Learning & development

- Platform for Skill Enhancement
- Learner profile: hands-On
- Cloud & Security Technologies

Delivery Excellence

- AR based Virtual Support
- Tutorials, MOOC, Videos
- Process Viewpoints
- Analytics & Prediction Learning
- Interoperability Tests

Product Development

- Collaboration with Young-minds
- Co-Create Standards & Patents
- Open Source Product Development
- White Labelled Product Tuning

Use Cases Development

- Outcome based Integrations
- Product Validation
- Start-up Incubator
- Re-usable Artifacts

With such a state-of-art infrastructure, we at L&T announced to have certainly acquired the Technological strength through in-house capability building, innovations and best-in-class solutions, and give our employees an edge to lead the market with technology leadership. Once again I would like to reiterate that Technology Innovation Center (TIC) is an Innovation lab to upkeep a design thinking culture and unlock our potential, making us stronger in the Digital World.

About the author



Madhukar is a telecom professional with over 33 years of experience and proven abilities in overall business management including P&L, strategic business development with core strengths in Planning & Engineering, Service deliveries, and Program Management of large geographically dispersed projects. He has created strong value proposition as Master System Integrator, across Public & Private sectors and ambitious projects like Digital India, Smart cities etc. Core strengths lie in motivating and leading large teams to deliver high impact performance.

Currently responsible for technology & Solutions as CTO with 'L&T- Smart World & Communication', and leading a team of Pre-Sales Engineering and Technology and as such contributing with wide experience and always demonstrating leading-by-example.

Prior to L&T, Madhukar worked with Sterlite as Business Head and prior to that in a leadership positions with renowned Indian telecom organizations like R Jio, Bharti Airtel Ltd, Tata VSNL and Dept of Telecommunications/ Bharat Sanchar Nigam Ltd. He belongs to 1985 batch of Indian Telecom Services, and has been awarded with "Sanchar Seva Padak" in May 2004, for outstanding contribution to Telecom

iToons

Sunil Agarwal & Ajit Ninan

